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Green endoscopy, one step towards a sustainable future: a review of the literature.

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Abstract:	Rapid climate change or climate crisis is one of the most serious emergencies of the twenty-first century, accounting for highly impactful and irreversible changes around the world. Climate crisis may also affect the epidemiology and disease burden of gastrointestinal (GI) diseases as they hold a connection with environmental factors and nutrition. GI endoscopy is a highly intensive procedure with a significant contribution to greenhouse gas (GHG) emissions. Moreover, endoscopy is the third highest generator of waste in healthcare facilities with significant contributions to carbon footprint. Main sources of direct carbon emission in endoscopy are the use of high-powered consumption devices (e.g., computers, anesthesia machines, reprocessing machines, scope processors and lighting), and waste production mainly derived from the use of disposable devices. Indirect sources of emissions are those derived from the heating and cooling of facilities, processing of

	histological samples, transportation of patients and materials, etc. Consequently, sustainable endoscopy and climate change have been the focus of discussions between endoscopy providers and professional societies with the aim of taking action to reduce environmental impact. The term "green endoscopy" refers to the practice of GI that aims to raise awareness, assess, and reduce endoscopy´s environmental impact. Nevertheless, while awareness has been growing, guidance on practical interventions to reduce carbon footprint of endoscopy are lacking. The aim of this review is to summarize current data regarding the impact of endoscopy on GHG emissions and possible strategies to mitigate this phenomenon. Further, we aim to promote the evolution of a more sustainable "green endoscopy".

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ABSTRACT

Rapid climate change or climate crisis is one of the most serious emergencies of the twenty-first century, accounting for highly impactful and irreversible changes around the world. Climate crisis may also affect the epidemiology and disease burden of gastrointestinal (GI) diseases as they hold a connection with environmental factors and nutrition.

GI endoscopy is a highly intensive procedure with a significant contribution to greenhouse gas (GHG) emissions. Moreover, endoscopy is the third highest generator of waste in healthcare facilities with significant contributions to carbon footprint. Main sources of direct carbon emission in endoscopy are the use of high-powered consumption devices (e.g., computers, anesthesia machines, wash machines for reprocessing, scope processors and lighting), and waste production mainly derived from the use of disposable devices. Indirect sources of emissions are those derived from the heating and cooling of facilities, processing of histological samples, transportation of patients and materials, etc.

Consequently, sustainable endoscopy and climate change have been the focus of discussions between endoscopy providers and professional societies with the aim of taking action to reduce environmental impact. The term "green endoscopy" refers to the practice of GI that aims to raise awareness, assess, and reduce endoscopy´s environmental impact. Nevertheless, while awareness has been growing, guidance on practical interventions to reduce carbon footprint of GI endoscopy are lacking. The aim of this review is to summarize current data regarding the impact of endoscopy on GHG emissions and possible strategies to mitigate this phenomenon. Further, we aim to promote the evolution of a more sustainable "green endoscopy".

INTRODUCTION

Rapid climate change is a serious emergency of the twenty first century. This climate crisis has created highly dangerous and irreversible changes with serious consequences around the world on a daily basis, from human health to economic and geopolitics.

According to the Global Climate Report of the National Centers for Environmental Information, the global surface temperature in September 2022 tied for the fifth highest position since the record began in 1880 [1].

Because of their impact on energy retention in the atmosphere, greenhouse gases (GHG) represent a critical link between human activities and rising temperatures. Deforestation, air pollution, and the use of fossil fuels contribute significantly to GHG production and accumulation, leading to global warming and extreme weather events.

The term ‘carbon footprint’ is defined by the Carbon Trust as “the total set of GHG caused directly and indirectly by an individual, event, organization or product.” GHG refers to any gas which accumulates in the atmosphere and absorbs and re-emits heat, thereby carrying the potential for global warming. Carbon dioxide (CO_2) accounts for 85% of all GHG, while other "CO_2 equivalent gases" include Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur hexafluoride (SF_6), Nitrogen trifluoride (NF_3), etc.

Consequently, the UK NHS has committed to a net-zero carbon footprint for directly controlled emissions by 2040 and net zero for those within its supply chain (indirectly) by 2045 [2]. Current global targets to face the climate crisis include reaching net-zero carbon emissions by 2050 and keeping rising global temperature below 1.5 ˚C [3].

Rising temperatures can have a direct impact on health, causing a significant increase in disease, morbidity and mortality, and potentially leading hospitals and health services to collapse.

Climate crisis may also affect the epidemiology and burden of gastrointestinal (GI) diseases since they have a close connection with environmental factors and nutrition. For instance, environmental changes may affect the quality and contamination of land and agricultural products thereby increasing the spread of infectious diseases in both developing and industrialized countries. The corollary of consuming poor-quality food has far reaching consequences which includes altering the epidemiology of GI cancers, increasing the level of stress of the general population, and possibly increasing the prevalence of gut-brain interaction disorders (DGBI) [4-7].

In a call to action to raise awareness about environmental issues and the need to keep the Earth's temperature stable, 197 countries signed the famous Glasgow Climate Pact in 2021COP 26. More recently, in November 2022 at Sharm el Scheikat WHO Health pavilion, at the United Nations Climate Change Conference COP 27, countries promised to reduce CO_2 emissions and decarbonization [8].

THE IMPACT OF GI ENDOSCOPY IN THE CARBON EMISSIONS

Healthcare systems are estimated to produce 4.4% of global GHG emissions (equivalent to the annual emissions from 514 coal-fired power plants) [9]. Gastrointestinal (GI) endoscopy has direct and indirect impacts on the global carbon footprint. This includes travel for patients and relatives, use of multiple single-use devices, repeated decontamination processes with high energy impact, frequent request for histological examinations, and nonrenewable waste production [10].

One procedure generates 1.5-2 Kg of plastic waste but only 0.3 Kg is recyclable. A recent estimate showed that the energy consumption over an average of 40 procedures per day was estimated at 31,416 kWh per year, accounting for carbon emissions of 22.1 tCO2 per year (Figure 1) [11-12].

In the UK the healthcare system is responsible for 6.3% of UK's total carbon emissions and 5% of total air pollution [13]. Of note, this estimate excludes the energy consumption necessary for heating and cooling which adds to the overall carbon footprint.

Concerning waste production, endoscopy is the third highest generator of waste in healthcare facilities, with significant contributions to emissions worldwide.

Each endoscopy bed-day is thought to generate approximately 3 kg of waste, and the specialty is responsible for 13,500 tons of plastic waste in the United States each year, making it the hospital's third-highest waste generator [10]. Most supplies used during endoscopic examinations are often disposable and made of plastic, resulting in approximately 2 kg of waste per procedure [12].

A recent study estimated the environmental impact of a digestive endoscopy unit by measuring the mass and volume of trash in suites, pre-procedure, and post-procedure areas [14]. The total waste generated during a 5-day routine in a high-volume endoscopic center was 546 kg, which included direct landfill, biohazard, and recycled waste. During the same period, 73 kg of total waste was generated in a low-volume center. Using the number of endoscopic procedures performed in the United States each year (18 million), the authors calculated a disposable waste production of 836,000 cubic meters per year, which is equivalent to covering approximately 117 soccer fields to a height of 1 meter with trash. Another analysis estimated CO2 emissions of more than 3 million gallons of gasoline consumed or more than 39 million pounds of coal burnt [12].

Sequestering the CO_2 produced by endoscopy procedures would take 112,009 acres of forests for 1 year [11,12]. Thus, to decarbonize health care, endoscopy represents a high-yield mitigation opportunity [14].

SOURCES OF CARBON EMISSION IN ENDOSCOPY

Direct sources of emission

Decontamination and reprocessing of endoscopic equipment

Equipment reprocessing is a critical step for reusable endoscopes where effective cleaning and sterilization is required to prevent transmissible infection. The process is complex and resource consuming, involves multiple cycles requiring large volumes of tap or filtered or deionized water (80-100L per wash), electricity, heat, disinfectants and detergents. Reprocessing may be broken down to include: precleaning, cleaning, disinfection, rinsing, drying, and cleaning of reusable components. Each endoscopy wash machine incurs approximately 24.67 kWh/d equating to 0.017 tCO2e/d) [12, 14-19].

In fact, some national or professional guidelines recommend using sterile water for rinsing endoscopes. If sterile water is not available, these guidelines recommend using potable tap water and flushing endoscope channels with alcohol [19]. The adoption of double basin washing machines uses less energy when cleaning 2 scopes (simultaneously) compared with single basin wash machines (600 W for 2 scopes cleaned vs 400 W for one scope cleaned, respectively) [11].

The consequences from improperly performed reprocessing of endoscopes can be disastrous to our patients, clinicians, and the organization. To this end, poorly cleaned endoscopes place patients at risk for acquiring infections. Additionally, exposure to biohazardous and toxic conditions in the reprocessing room can be harmful. The centralization process is driven with the primary goals of increasing reprocessing oversight and efficiency, increasing productivity through the deployment of a dedicated reprocessing team, promoting standardization of products utilized in reprocessing, reduction in the requirements for capital reprocessing equipment, and reducing reprocessing variability [19].

Single-use devices

The use of disposable materials in endoscopy mainly refers to two areas: single-use ancillary devices and single-use endoscopes.

Endoscopy requires a significant number of single-use ancillary devices. Most of them are disposable, and made of plastic, accounting for approximately 1.5-2 kg of waste per procedure [12,14,18]. Moreover, digestive endoscopy and its accessories produce significant amounts of highly polluting elements such as nickel, titanium and synthetic polymers [15,16].

Concerning single-use endoscopes, recent research has been focused on duodenoscope-associated infections. In fact, the use of these endoscopes poses a significant reprocessing challenge for a variety of reasons, and a recent meta-analysis of over 13,100 samples revealed a 15% contamination rate of reprocessed patient-ready duodenoscopes [17,18]. However, the clinical impact of contaminated endoscopes is debatable.

Single-use endoscopes have been developed as a solution to decreasing endoscopy—related infections. In addition, the concept of single-use endoscopes has expanded from duodenoscopes to gastroscopes and colonoscopes.

Nevertheless, the sustainability of these endoscopes is still debated, since recyclable metal represents only a smaller part of the endoscope and, therefore, the main part of the device is disposed of in the same way as other waste [20].

Concerning reprocessing-related emissions, recent data showed that using single-use endoscopes, with an assumed infection rate of 0.02%, would produce 20 to 47 times the CO_2 emissions of reusable duodenoscopes without accounting for packaging or transporting of disposed duodenoscopes [21].

Moreover, a recently published paper has quantified the implications of a single-use endoscope and showed that it would result in 40% increase in total waste after accounting for the lack of waste from reprocessing [14].

If all endoscopic retrograde cholangiopancreatographies (ERCP) and colonoscopies were performed with disposable rather than reusable devices, the net waste mass generated per endoscopic procedure would increase by 25%, even if waste mass generated from reprocessing would decrease [14].

A recent RCT showed that in patients with bacterial infections (with positive rectal swab), the rate of post-ERCP infections was 0% after testing for the pathogens isolated from the rectal swab prior to the procedure [22].

In the United States, approximately 500,000 ERCPs are performed annually [23]. The rate of serious infections occurring is about 0.007% (36 cases per 500,000 procedures) likely due to ineffective cleaning based on 2018 data. The use of disposable endcaps would be able to reduce this number by half, to a theoretical rate of 0.0046% (23 cases per 500,000 procedures). With a contaminations rate of 1/1600 ERCPs and a transmission range from 1/1,800,000 to 1/276,000 ERCPs, the risk of a patient becoming infected by a contaminated endoscope seems to be exceptionally low, at too high a cost for the current and future generations (ICER 500,000 USD) [21].

Despite their theoretical advantage, the role of single-use endoscopes is still debatable. It should be clarified which instruments are to be considered for single-use only (duodenoscopes only or also gastroscopes and colonoscopes). The type of patients should also be clarified (e.g. ICU, frail or immune compromised). Additionally, the minimal level of preventable infections should be defined. Importantly, the ability to recycle single-use instruments should be transparent [10].

The recycling programs offered for disposable endoscopes involves the recycling of only a small portion of the endoscope while the rest is burnt, like other trash [18].

A recent international group of experts identified a series of best practice recommendations for single use endoscopes and accessories using a modified Delphi process. They concluded that further research is needed for expanding possible indications of single-use scopes. Additionally, it was recommended that single use endoscopes should be distributed with an effective recycling mechanism in place, considering patient characteristics and setting (frail, immunocompromised patient or treated in an intensive care unit setting, ongoing sepsis or MRDO infections).

Overall, the safety, environmental impact, sustainability and acceptability of single use endoscopes should be explored prior to their adoption [19].

High power consumption devices

Endoscopy facilities are characterized by their high energy consumption. The main sources of energy consumption within endoscopy units are, in descending order: 1) computers, 2) anesthesia machines, 3) washing machines, 4) scope processors and 5) lighting [11].

Computers consume a large amount of energy. However, they enable data digitization and avoid secondary emissions resulting from paper consumption. However, their consumption must be limited, especially when not in use.

The reprocessing of reusable endoscopes is a resource-intensive process that requires large amounts of water (30 gallons per cycle), disinfectants, detergents, as well as electricity (24.67 kWh per day) [12].

Similarly, lights can be optimized by replacing halogen lights with LEDs and optimizing their use (for example, using soft lights during endoscopic tasks, and ensuring they are switched off when not in use).

Personal protective equipment

Personal protective equipment (PPE) (e.g. face-masks, gowns, aprons, gloves) are often used during endoscopy. The need for PPE grew during the COVID-19 pandemic and increased the production of waste (about 8,060,000 Kg per year in Italy), with significant environmental consequences [24-27]. For these reasons, PPE-related waste may be minimized by bringing together COVID patients on the same endoscopy list. Moreover, PPE capable of being disinfected and refusable should be preferred, when feasible.

Indirect sources of emission

Endoscopic activities are also characterized as having indirect emissions. These include the journey of patients to hospitals, especially referral centers, which are usually further away. To this end, travel generates considerable GHG emissions. Added to this are the costs of transporting materials required by endoscopy units. This cost can be higher depending on the distance between the producer and consumer [11].

Moreover, packaging of supplies used in endoscopy significantly impacts GHG emission, and accounts for a significant rate of plastic waste. As a result, about one million metric tons of clean plastic is generated by healthcare systems each year, with only a minimal amount of this plastic waste being recovered [26].

Finally, endoscopy often requires additional diagnostic examinations such as histology.

Processing of biopsy samples taken during endoscopy is responsible for high GHG emissions. Above all, this concerns all the steps necessary for the processing of biological samples including the production and travel of chemical reagents, the production of waste, and electricity consumption.

Applied to more than 20 million biopsies performed in the US annually, emissions from biopsy processing are equivalent to yearly GHG emissions from 1,200 passenger cars [28].

STRATEGIES TO IMPROVE THE SUSTAINABILITY OF ENDOSCOPY

Gastroenterologists and endoscopists should reconsider daily activities and pay more attention to sustainability. The term "green endoscopy" refers to the practice of GI that aims to raise awareness, assess, and reduce the environmental impact of endoscopy.

In this regard, measures may be applied to mitigate carbon footprint and favour the evolution of a more sustainable "green endoscopy".

According the World Health Organization (WHO) the general strategies for reducing GHG emissions can be summed up in "3 Rs": "Reduce, Reuse, Recycle" [10,11]. Other important Rs are Review, Research and Re-invent, Recover, and Repair [29].

All these principles can be applied in endoscopy with a multi-level approach, from individuals to institutions (Figure 2).

<u>Inappropriate diagnostic and follow-up examinations</u>

Data from literature show that the rate of inappropriate examinations reach up to 52% of upper GI endoscopies and 23% to 52% of colonoscopies [30].

Therefore, a first step is that of reducing the number of inappropriate diagnostic examinations, such as in young patients without risk factors or alarm symptoms.

Another point is reducing inappropriate endoscopic follow-up. The most frequent cases are follow-up of chronic distal atrophic gastritis without dysplasia and no additional risk factors, peptic duodenal disease, or low-risk polyps removed at colonoscopy. In these cases, it is important to avoid unnecessary testing and ultimately reduce GHG emissions [31]

In this regard international guidelines for improving endoscopic appropriateness should guide clinical practice on indications for surveillance and diagnostic endoscopy (Table 1) [29, 32-33].

Moreover, several non-invasive biomarkers can be used which allows endoscopy to be avoided in the diagnosis or follow-up of some GI diseases. For instance, the Baveno VI criteria (i.e., liver stiffness measured (LSM) < 20 kPa and PLT > 150 x 10^9/L) can be used to predict patients with advanced chronic liver disease in whom the risk of varices is low, and upper endoscopy deemed unnecessary [34-35].

Concerning the lower GI tract, the faecal immunochemical test (FIT) is used as a primary screening method for colorectal cancer, ruling out non-at-risk patients in whom colonoscopy is not indicated [36].

Additionally, in patients with IBD, fecal calprotectin is used as a non-invasive marker of response, reducing the need for endoscopic follow-up and to rule out organic diseases in patients with functional disorders [37].

Biopsy sampling and histology

As discussed above, processing of biopsy samples taken during endoscopy is responsible for high GHG emission. Above all, this concerns all the steps necessary for the processing of the sample, the production and travel of chemical reagents, the production of waste, electricity consumption.

Applied to more than 20 million biopsies performed in the US annually, emissions from biopsy processing are equivalent to GHG emissions from 1,200 passenger cars yearly [28]. Therefore, it is essential to apply mitigation strategies aimed at limiting histological examination only to necessary cases, informed by guidelines and correct number of samples [38-39].

Furthermore, innovations in endoscopic imaging (e.g. virtual chromoendoscopy and magnification) has improved mucosal visualization and endoscopic diagnosis. These improvements help to identify low-risk lesions such as hyperplastic polyps which enables a “resect-and-discard” and/or “diagnose and leave” approach, thus avoiding unnecessary histology [40].

Looking ahead, the implementation of artificial intelligence (AI) with computer-aided characterization (CADx) will allow a further gain in optical diagnosis in favor of strategies that do not require histology [41].

When planning an endoscopic procedure, the environmental impact of disposable and reusable devices should be considered. Furthermore, when purchasing medical accessories, endoscopic instruments, and washing machines, those with a lower carbon footprint (which should be clearly indicated on product labels by the manufacturer) or made from recyclable materials should be preferred.

Procedures to be repeated or rescheduled

Another crucial area has to do with reducing the number of endoscopic exams that have to be rescheduled. This frequently occurs in patients who must perform colonoscopy and who do not achieve an adequate degree of bowel preparation, or in patients who must perform upper GI and have not followed the dietary rules, or in patients who must perform operative procedures but who have not followed guidelines on the suspension of antiplatelet/anticoagulant agents.

This goal can be met by improving patient communication and appointment scheduling, choosing the best effective and safe bowel preparation for colonoscopy, and managing antiplatelet and/or anticoagulant drugs [42-44].

Resource optimization

Wasteful use of resources within an endoscopy unit leads to higher cost and environmental impact. Strategies aimed at optimizing resources should be adopted. For example, the adoption of recyclable materials, the use of reusable or recyclable PPE, and the purchase of local products that reduce transport distances.

Sterile endoscopic water should also be limited to patients at high risk of infection such as immunocompromised patients. Tap water should be used routinely in the irrigation bottle, since it has been demonstrated to be as safe as sterile water. This would have both environmental and economic impacts [45].

Energy optimization

Energy consumption from electricity accounts for 10-30% of the environmental impact of individuals and healthcare systems [11].

The use of electricity is another element that contributes to the environmental impact of endoscopy. Green use of energy should be promoted in all endoscopy units: lights should be turned off when not in use for long periods, halogen should be replaced by LED lights, optimize heating and air conditioning necessary to maintain a comfortable ambient temperature, shutting down computers overnight, and use of renewable energies (e.g. photovoltaic) should be promoted when possible [11]. Finally, rechargeable batteries should be preferred over standard ones.

Waste minimization, reuse, and recycling

Waste management and disposal are essential to reduce GHG emissions.

As discussed above, the waste-management hierarchy should be based on the concept of the "3Rs": reduce, reuse, and recycle (Figure 3).

The most preferable approach should be avoiding the production of waste as much as possible and minimizing the quantity entering the waste stream. Where feasible, according to best practice, recovering items for secondary use is the most preferable option. Waste that cannot be recovered must then be dealt with by least preferable options, such as treatment or land disposal, to reduce its health and environmental impacts [46].

Endoscopy rooms should have a plan for proper waste disposal, with separate bins dedicated to each item (paper, plastic, glass, etc.) to ensure proper recycling.

Telemedicine and electronic records

The migration of patients towards tertiary treatment centers, which are generally located at greater distances, can add to transport-associated emissions.

The COVID pandemic has accelerated the spread of telemedicine, which now represents a fundamental resource of the healthcare system. Data shows that telemedicine is highly effective and financially beneficial. Moreover, it may reduce transport-associated emissions with carbon footprint savings ranging between 0.70-372 kg CO^2 per consultation [47].

Additionally, the use of paperless communication, electronic reports/letters, and encouraging patients to sign up to view their results online would save both paper and gas mileage [18]. Adopting double sided printing or reducing the number of printed copies can also have a small but positive environmental effect [13].

Telemedicine can be used for follow-up visits in patients with chronic diseases (e.g. chronic liver diseases, IBD etc.) or reviewing laboratory tests or histological reports (e.g. following endoscopy) [48-50].

In addition, teleconsultation can be used for consultations between specialists and meetings with multidisciplinary teams (MDT).

Moreover, in the field of digital technologies, the use of electronic medical records (EMRs) as well as the generation of digital reports over paper copies, may improve not only the accessibility of information, but also the environmental impact.

THE ROLE OF INSTITUTIONS AND SCIENTIFIC SOCIETIES

Institutions will play a key role in determining the environmental sustainability of endoscopy. Firstly, increasing physician and staff awareness is needed, which can be achieved by implementing educational programs.

Secondly, partnering with industry is important for creating a shared vision aimed at reducing direct and indirect emissions. It will be crucial to share strategies with manufacturers aimed at optimizing production, product packaging, and distribution.

Furthermore, providing financial incentives may support eco-friendly projects and facilitate sustainable transitions.

Scientific societies will play a decisive role in this process. Many of them have already issued consensus statements which summarize the guidelines to be adopted for a green endoscopy including the Association of the European Society of Gastrointestinal Endoscopy (ESGE) and European Society of Gastroenterology and Endoscopy Nurses and Associates (ESGENA) [51], the British Society of Gastroenterology (BSG) [52], and the Italian Association of Hospital Gastroenterologists and Digestive Endoscopists (AIGO) [29].

In the future, it would be desirable for other national scientific societies to fit this job by issuing tailored position statements at the national level, based on geographical differences and local needs.

In addition to the formal recommendations, a periodic audit to verify the adherence of the individual endoscopy units to recommended standards, as well as certification and accreditation of green endoscopy on the national level will be necessary [12].

Finally, scientific societies should act to encourage educational models, and promote further research on green endoscopy.

The next step is to seek individuals who can support the change both at management and grass roots levels, creating a “guiding coalition” and constant presence. This would involve making the changes that are easy to achieve by staff members but have a significant impact [13].

CONCLUSIONS

The climate crisis calls for quick and decisive action. In this setting, the healthcare system contributes significantly to the climate crisis but it has the opportunity to be part of the solution. Therefore, it must be involved in raising awareness and helping to develop regulatory guidelines aimed at mitigating GHG emissions.

Concerning endoscopy, the near future goal is to make endoscopy units ‘green’ through uniform worldwide action. Measures aimed at reducing emissions have been mentioned above; the careful evaluation of the indications for endoscopic and histological examinations, the rationalization of disposable devices, careful management of PPE, optimization of energy use and correct waste disposal are practical strategies.

Moreover, a fundamental role will be played by telemedicine to reduce the environmental impact linked to the transport of patients for follow-up visits.

Looking ahead, endoscopy units will have to be evaluated in terms of performance and efficiency globally. To this end, sustainability should now be considered a central domain of quality in healthcare, extending the responsibility of health services to both current and future patients.

We believe that healthcare institutions will also play a key decision-making role in this green transition. Economic investments and partnership with stakeholders in terms of enhancing healthcare's economic, social, and environmental impacts will be essential to achieving these goals.

However, the cultural aspect also plays a key role. Therefore, in addition to focusing on general regulation, it will be necessary to invest in the education of the younger generations. To this end, schools should include curriculum focused on a greener climate.

For trainees, it is crucial that the concept of green endoscopy is formally included into the endoscopy training program from the beginning.

In conclusion, it is time to act at multiple levels to ensure green endoscopy worldwide.

While this requires massive change, we can no longer continue hearing examples of how many football fields are needed to accommodate the waste of a hospital ward or how many acres of forest would be needed to clean up the CO_2 emitted by a hospital. We need to move the conversation forward with sustainable action. We must work closely together to ensure the present and future sustainability of our planet and health.

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Table 1. Digestive findings that might not require endoscopic surveillance.

	Condition	Prevalence	Malignancy risk
Esophagus	Inlet patch	0.1 % – 12 %	0 – 1.6 % risk of dysplasia
	Erosive esophagitis LA grade A or B	11%	0 – 9 % risk of Barrett's esophagus
	< 1 cm columnar-lined esophagus	10%	No increased risk of esophageal cancer
Stomach	Intestinal metaplasia or atrophy limited to one location (i. e., antrum or corpus only) without dysplasia	Up to 25%	0.55 % risk of progression to gastric cancer
	Fundic gland polyps	13%-77%	No documented risk of gastric cancer if < 1 cm and no suspicious features
Subepitelial lesions	Leiomyoma	0.08% - 0.43%	Benign lesion
	Lipoma	0.2%	Benign lesion
	Pancreatic rest	0.6%-13.7%	Anecdotal malignant transformation
Duodenum	Duodenal peptic ulcer	2%-13%	No cancer risk
Pancreas	Serous cystic neoplasm	Up to 16% of pancreatic cystic neoplasms	Benign lesion
Colon	Low-risk adenomas (adenoma <10 mm without high grade dysplasia, or < 4 adenomas, or serrated polyp < 10 mm without dysplasia).	~15 % – 30 %	No increased risk versus general population

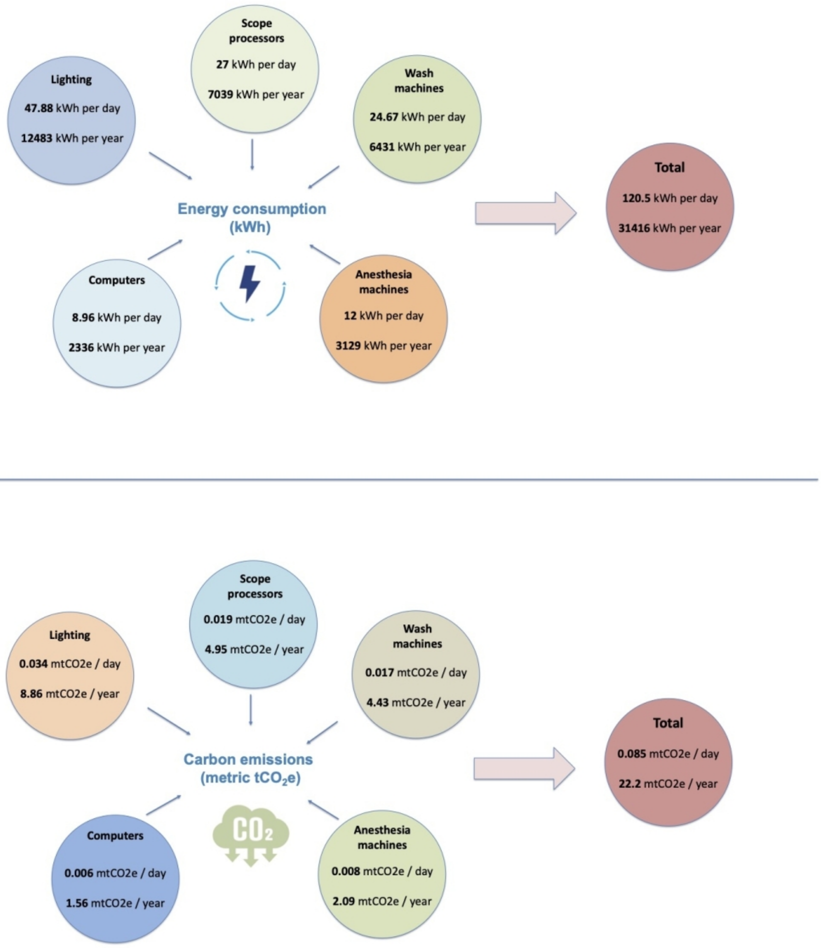

Figure 1

549x600mm (72 x 72 DPI)

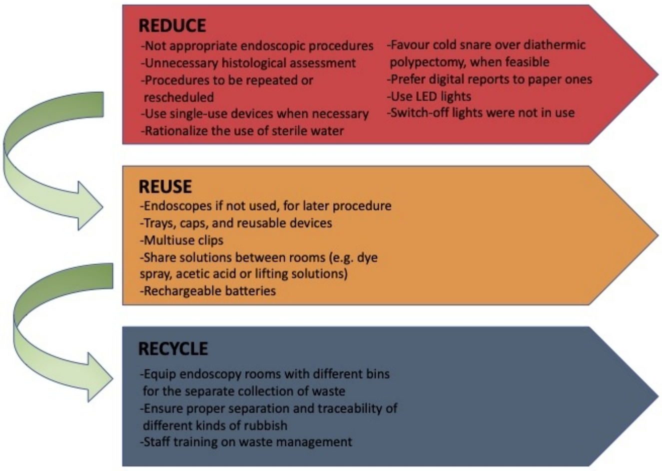

Figure 2

338x190mm (72 x 72 DPI)

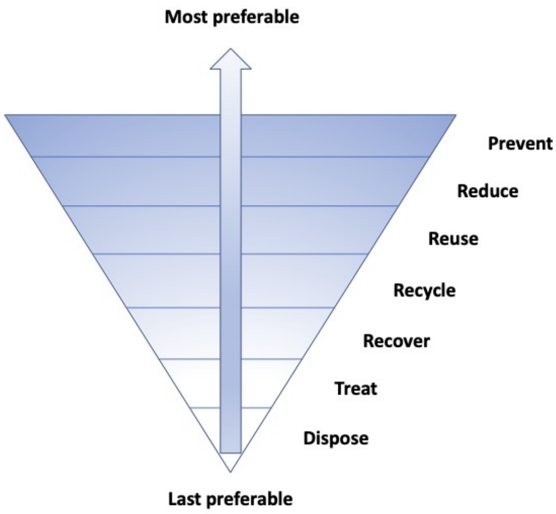

Figure 3

338x190mm (72 x 72 DPI)